

Aix-Marseille Université - CNRS UMR 7376

Laboratoire Chimie Environnement

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PhD position :

New pollutants from modern cars: atmospheric transformations and implications for urban air quality

The demand for urban mobility is steadily increasing and the growing number of vehicles deteriorates urban air quality in Europe and throughout the world. Transport accounts for a third of the energy consumption in the EEA countries, for more than a fifth of greenhouse gas emissions, but also for urban air pollution, noise nuisance, biodiversity fragmentation and traffic congestion. The transport sector is a major contributor to ambient pollution, including airborne particles, soot, metals, NO_x and ozone. Legislative authorities have imposed stringent emission limits on nitrogen oxides and particulate matter, in addition to requiring a reduction in CO₂ emissions. In response, car manufacturers have made in-engine modifications and introduced exhaust after-treatment technologies. Recent findings indicate that these changes may cause significant emissions of non-regulated pollutants (reduced nitrogen compounds, hydrocarbons, metals). These are highly reactive in nature and will be rapidly transformed in the atmosphere and interact with human respiratory tract. The reaction pathways and consequences are hitherto unknown.

The overall aim of the proposed project is to enhance scientific knowledge on the emissions and the fate of pollutants from modern vehicles (Euro5/Euro6). The PhD project will combine emissions measurements of primary pollutants (both in gas and particle phase) and the investigation of the atmospheric aging of such pollutants, their potential to form ozone and secondary organic aerosol (SOA). The atmospheric transformations of car pollutants will be investigated in a smog chamber and in a aerosol flow tube. Detailed laboratory studies will focus on the impact of metal nanoparticles and reduced nitrogen compounds (ammonia and urea from SCR-technology) on the formation of secondary particles. Emissions test will be performed at the IFSTTAR laboratory (Bron).

The laboratory LCE will run the mobile platform MASSALYA equipped with state of the art instrumentation for on-line analysis of particles (TAG, HR-ToF-AMS, LAAPToF, SMPS, MAAP) and gaseous pollutants (PTR-ToF-MS). Filter samples from emissions and secondary particles will be collected and toxicity studies will be performed in collaboration with the IMBE. The outputs of the project will implement first 0-D then in air quality models used by the air monitoring networks in collaboration with CEREAL laboratory.

Candidate requirements

The candidate should have a diploma (Bac+5, Master Degree or equivalent) before end of September 2018. Required notes M2 (≥ 14) and a good notes for the previous years. The candidate should own a solid background in chemistry, physics or engineering and be interested on experimental work.

Please send a CV and M2 grades to Dr. D'Anna before 01/04/2018 (barbara.danna@univ-amu.fr)